NOTES ON THE RELICT PALM *LIVISTONA MARIAE* F. MUELL. IN CENTRAL AUSTRALIA

by P. K. LATZ*

Summary

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Comparison of photographs taken after intervals of up to 56 years indicate that the relict palm *Livistona mariae* may reach an age of up to 300 years. Aspects of the ecology of the palm are presented.

Introduction

Palm Valley, situated in the Finke Gorge National Park in the MacDonnell Range system, Northern Territory (Fig. 1) is of considerable interest to tourists and scientists alike largely because of the presence of a stand of the relict cabbage palm *Livistona mariae* F. Muell. This species of *Livistona* is restricted to an area of about 60 km² on the Finke River and its tributaries. It is a relict species separated by about 1000 km from the nearest *Livistona* to the north. The closest relative to *L. mariae* occurs on the Fortescue River in the Hamersley Ranges, W. Aust., a stand in many ways similar to that at Palm Valley. The relict nature of the palms is discussed by Keast (1959), Burbidge (1960) and Chippendale (1963).

Although the explorer Ernest Giles was the first to discover the palms in the Finke Gorge in 1872, he almost certainly bypassed Palm Valley itself, and its discovery is attributed to a Lutheran missionary from Hermannsburg Mission some time later. The valley was investigated by members of the Horn expedition during 1894 (Tate 1896). After a visit to the Valley, Lothian (1959) discussed aspects of the palm's reproductive behaviour.

Chippendale (1959) listed 200 plants found to occur in Palm Valley. Since this time a total of 333 plant species have been recorded from the valley (about a quarter of the total number of species recorded for the whole of central Australia!). About 10 percent of these species can be considered to be of rare or restricted distribution in central Australia. The majority of these rarer species are restricted to areas in the valley fed by permanent water seepage.

Recently a large gas field has been discovered in the area adjacent to and north of the Park. Two gas bearing wells are situated only a few kilometres north of Palm Valley and tapping of these wells for commercial production is being considered.

The Habitat

The palm has a shallow fibrous root system and is situated in an arid area. Therefore a suitable habitat for its continued survival must have a permanent shallow water supply over an area large enough to support a viable breeding population. The area must also be protected from severe erosion forces or have a stable soil environment, as the palm will not survive scouring of surrounding soil.

Palm Valley appears to be one of the very few areas in the central ranges which meets all of these requirements. The permanent water supply in the valley appears to be associated with the peculiar stratification of this area. The gently sloping conglomerate and sandstone strata percolate water from a large catchment area, down to where the valley dissects these strata. The position of this dissection ensures a continuous permanent seepage area along a considerable distance of the valley floor and lower slopes. Although other springs and seepage areas occur in the Ranges, few, if any, extend over such a continuous area. The Finke River bed below Palm Valley has a permanent

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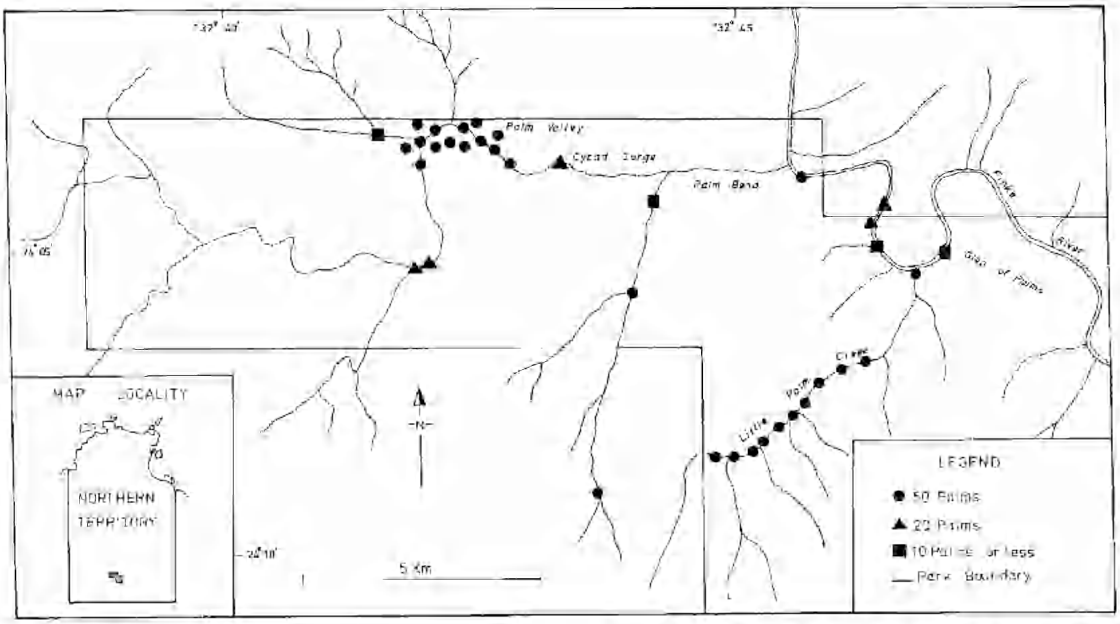

Fig. 1. The distribution and numbers of mature individuals of the cabbage palm *Livistona mariae* in the Finke Gorge National Park, Northern Territory.

shallow water table for much of its length, but it is subject to severe water wash and the few palms found there are restricted to areas which escape the full force of the floodwaters.

Palm Growth Rates and Ages

The author was fortunate in obtaining a number of accurately dated photographs of certain areas of the valley taken as early as 1917. Exact relocation of many of the source points was made possible by the cliff backgrounds of most of the photographs and the fact that the narrow valley is restricted in the number of photographic vantage points.

Of the 13 photograph sites relocated, three are presented in Figs 2–4. The palms in Fig. 2 show the least change of any of the palms investigated and almost all of the individuals present in 1917 (when the photograph was taken) are now still present. The present heights of the living palms were estimated with a Suunto clinometer. By using the cliff background as a scale, palm heights at the time of the earlier photograph were estimated. Distortion due to angle of viewing and to lens aberration was estimated to be less than 10 percent. A mean annual growth rate of 10 cm was estimated for this group of palms.

Palms in Fig. 3, however, have grown approximately 11½ m in 38 years, a mean annual growth rate of 30 cm. Palms in Fig. 4, which apparently were absent in the earlier photographs, taken in 1918, are now up to 12 m high, a minimum mean annual growth rate of 22 cm.

Palms grown from seed in Miami, Florida, on the bank of a permanent stream, grew to a height of 9 to 18 m in 27 years—an exceptional growth rate of up to 60 cm per year (Lothian 1959). A palm in the cooler climate of Melbourne Botanic Gardens is reputed to have grown to only 3.75 m in 30 years, a growth rate of 12.5 cm per year (Australasian Post, 31 May, 1973).

In its natural habitat, the rate of growth of the palm appears to be mainly dependent on the water supply. The palms showing the fastest growth rate (Fig. 3) are at Palm Bend on the bank of the Finke River about 6 km east of the Valley. This area has a greater depth of fertile alluvial soil and a better water supply than most areas in Palm Valley. Palms in Fig. 4 are situated on one of the best spring areas in the valley, whereas those in Fig. 2 occupy one of the drier areas of the valley, as is reflected by their slower growth rates.

The tallest palms in the valley have reached a height of 25 m. Making allowances for different growth rates at various ages, 100 to 300 years seems a reasonable estimate of the age of the oldest individuals of *Livistona mariae*.

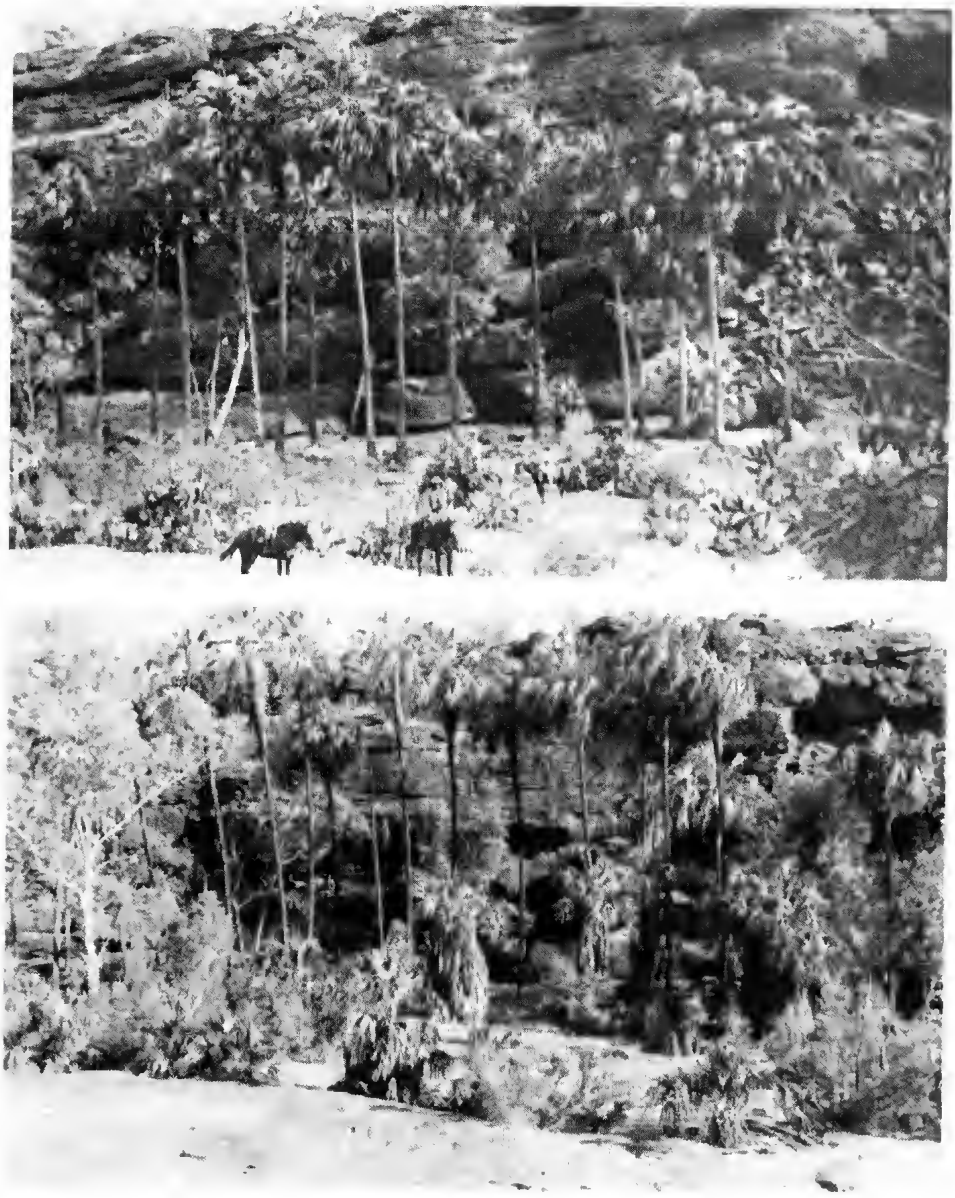

Fig. 2. The upper photograph was taken in 1917 and the lower in 1973.

Effect of Fire

The areas of high palm densities are susceptible to fire as large amounts of plant debris accumulate around the base of the palms. A small area of the valley was subjected to a natural fire in the early part of 1973 and the area was visited by the author approximately 2 months after the event. The fire appeared to have been intense; a palm 28 m high was burnt at the crown and thick ashes (up to 40 cm deep) were found at the bases of the majority of the palms.

Ninety-six established palms were affected by the fire, thirty of which subsequently died. To ascertain whether certain height classes of the palms had higher survival rates, the heights of all affected palms were measured with a Suunto clinometer. Results indicated that the palms in the height range of 5–8 m had greater mortalities than those in the 1–3 m height

Fig. 3. The upper photograph was taken in 1935 and the lower in 1973. The white bed of the Finke River can be seen in the foreground.

range. However, statistical tests showed no significant difference between the two height populations.

A localised fire was reported in the same area in the 1940's and this fire was severe enough for the smoke to be seen from Hermannsburg Mission, 12 km distant and on the other side of the Ranges. After several subsequent rains, regeneration of palms was reported to be abundant. (A. Latz, pers. comm.) A fire is also known to have occurred through the stand in Little Palm Creek early in 1959, but little evidence of this fire is now apparent.

It does appear that many of the palms can survive a fire and subsequent regeneration is quite rapid. However, an excessive accumulation of debris over a long time period could provide enough fuel for a more severe and extensive fire than those previously observed, and could effect a higher palm mortality. If this fire followed a few years of poor seed produc-

Fig. 4. The upper photograph was taken in 1918 and the lower in 1973. This area was relocated by using the large rock right of centre in the earlier photograph as a marker. This rock is hidden by palms in the later photograph.

tion, or if a severe flood subsequently removed the majority of seeds, palm densities could be severely reduced.

Palm Numbers

Tate (1896) stated, " . . . *Livistona mariae* is known by only one colony estimated to comprise not more than a hundred mature individuals". A few were also observed by him along the Finke River as far as Boggy Hole. Keast (1959) estimated a total of at least 300 individuals at all stages of growth were present in the valley.

An exact count of all individuals in the valley is impractical because of the high densities of the palms in some areas and the many younger palms at all stages of growth. However, individuals of reproductive age (ca. 3 m or taller) were found to have at least some of their trunk clear of leaf debris and are relatively easy to count. A count made early in

1973 indicated that about 750 palms of reproductive age occur in Palm Valley.

This is a much greater number than those previously given. Several recent visitors to the valley were asked for their estimates of palm numbers and these ranged from 30 to 800 with an average of 150. These observations tend to show that rough estimations give a lower number than is actually present and may account for the previous low estimates. However, the early photographs, including those not presented in this article, do show lower palm densities than those at the present time.

Stirling (1896) reported that the white basal parts of the inner leaves of the young palms were eaten by aborigines in the area. This would have caused the death of at least some of the palms. This practice has now ceased. In the past, aborigines frequently lit fires to hunt game, stimulate regrowth of some edible plants and signal their presence to other members of the tribe. Only two fires of restricted extent are known to have occurred in Palm Valley during this century. Before this time the aborigines may have burnt the area more frequently to stimulate growth of young palms which could then be used for food.

Contrary to Tate's observations, there are as many palms outside Palm Valley as in the valley itself (Fig. 1). The second largest colony is in Little Palm Creek where 550 mature individuals have been counted. Except for about 6 palms further downstream in the Finke River, the location of all individuals of *Livistona mariae* known to occur naturally is indicated in Fig. 1. All of the palms of reproductive age have been counted and total 1500. Counts of all of the palms in small representative areas (including established seedlings) show that the palms of reproductive age constitute less than half of the population. Therefore the total number of established individuals of *Livistona mariae* (the total naturally occurring world population) is estimated to be upwards of 3000.

After a good season, each mature palm produces an abundance of seeds with a high natural rate of germination. Although few of these seedlings are able to get their roots into the rock fissures before they are washed away or die of desiccation, there is present in the populations a wide range of all growth stages. Seeds of other palms are usually slow to germinate and quickly lose their viability unless kept in humid conditions (de Leon 1958), but seeds of the cabbage palm can germinate within months and remain viable for two or more years under dry storage.

Discussion

The cabbage palm is restricted to a small area and its numbers are small. However, it has a relatively fast growth rate, high potential for reproduction, and a relatively rapid ability to recover after fire, all factors that indicate the palm is in no real danger of extinction, provided the present ecosystem is not substantially altered. In fact, numbers appear to have increased somewhat in the last 50 years.

The greatest danger to the continued health of the stand would arise from the lowering of the water table or general disruption or pollution of the seepage area. Fortunately the structure of the sediments probably ensures that this possibility is remote. The relict nature of this unique palm warrants close attention to the general health of the stand and prevention of any disturbances to the area. The planting of palms in other areas of Australia to ensure that replacements are available in case of natural disaster is recommended.

Conclusion

Palm Valley is situated on the edge of a large gas field. The valley is unique botanically, not only because of the presence of the palms, but also because of the high number of other rare plants and the overall diversity of the flora. A recluse area such as this, is by nature fragile, and therefore any development in this area will require great care and foresight.

Acknowledgments

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